

IN THE CLAIMS:

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B<sup>1</sup> 1. (Currently Amended) A method of detecting the flatness of a band product running along a longitudinal direction and at high temperature, in which the band (2) is subject to tensile load and applied on the angular sector of a measuring roll (4) mounted to rotate round an axis perpendicular to the longitudinal running direction of the band (2) and having a cylindrical external face (13) comprising an angular contact sector with the band and a free sector, comprising the steps of:

measuring the load applied to the roll in several detection zones distributed along a length of the roll;

~~characterised in that the roll (4) is cooled~~ cooling the roll down forcibly by circulating a heat exchanging fluid along at least one portion of the free sector of the external face (13) of the roll; (4) and ~~one determines~~

determining the parameters responsible for the cooling efficiency such as the opening (B) of the angular cooling sector along which the fluid circulates, the initial temperature of the said fluid and the circulation flow rate, so that, after heating up while passing through the sector (a, a') in contact with the band (2), the external face (13) of the roll (4) is brought back, after passing through the cooling sector (b, b') of the roll (4), to a pre-set equilibrium temperature.

2. (Currently Amended) A The method according to claim 1, ~~characterised in that~~ wherein forced cooling of the roll (4) ~~is performed by~~ includes:

spraying a heat exchanging fluid over at least one portion of the free sector of the roll; (4) and one

adjusts adjusting at least the temperature of the fluid and the spray flow rate in relation to the temperature of the band (2) and the thermal exchange conditions, in order to bring back to a set level the temperature of the external face (13) of the roll (4) immediately before it goes through the contact sector (a, a').

3. (Currently Amended) A The method according to claim 1, ~~characterised in that~~ comprising:

locating the flatness measuring roll (1) ~~being located~~ beneath the band (2), immersing a lower section of the external face (13) of the said roll ~~comprises a lower section (b, b') immersed~~ in a heat exchanging fluid bath (31) provided in a tub (3) situated beneath the roll; (1) ~~and associated with means for~~

circulating the liquid with an adjustable flow rate between an inlet orifice and an outlet orifice of the tub; (3), and ~~one adjusts~~

adjusting at least the initial temperature of the liquid as it reaches the bath and the circulation flow rate, in order to bring back to a set level the temperature of the external face (13) of the roll (4) immediately before it goes through the contact sector (a, a').

4. (Currently Amended) A The method according to one of the claims 1, 2, or 3, ~~characterised in that~~ including bringing the external face (13) of the roll (4) ~~is brought back~~, before it goes through the contact zone (a, a'), to an equilibrium temperature (t)

that is linked with the temperature of the band ( $t_1$ ) and the initial temperature ( $t_2$ ) of the heat exchanging fluid by a formula such as:

$$t = \frac{a \sqrt{A} t_1 + b \sqrt{B} t_2}{a \sqrt{A} + b \sqrt{B}}$$

(Cont'd)

in which (a) is the thermal exchange coefficient between the band (2) and the roll (1), (b) is the thermal exchange coefficient between the heat exchanging fluid (34) and the roll (1), (A) the angular contact sector ( $a, a'$ ) and (B) the angular cooling sector: ( $b, b'$ ) and one can act,

manipulating during operation, ~~on~~ at least one of the parameters of the said formula in order to maintain the equilibrium temperature ( $t$ ) at a constant level.

5. (Currently Amended) A device for detecting the flatness of a band product (2) running along a longitudinal running direction and subject to tensile load, comprising:

a measuring roll (1) mounted to rotate round an axis perpendicular to the longitudinal running direction and on which the band (2) is applied under tensile load, ~~whereas~~ wherein the said roll (1) has a cylindrical external face (13) comprising an angular contact sector ( $a, a'$ ) with the band and a free sector, several detection zones distributed along a length of the measuring roll, and means for measuring a load applied to the roll in each zone;

~~characterised in that it comprises~~ means (3, 34) for forced cooling of the external face (13) of the roll (1) by circulating a heat exchanging fluid along at least one portion ( $b, b'$ ) of the free sector of the roll; (1) and

means (30) for adjusting the cooling conditions in order to maintain the external face (13) of the roll (1) at a set temperature.

B'  
(cont'd)

6. (Currently Amended) ~~A-detection~~ The device for detecting the flatness of a band product according to claim 5, ~~characterised in that as~~ wherein the measuring roll (1) is placed beneath the band (2) and comprises an upper angular sector (a, a') in contact with the band (2) and free lower angular sector, and the forced cooling means comprises a tub (3) filled with a heat exchanging liquid ~~tub (31)~~ in which is immersed at least one portion (b, b') of the free sector of the roll, and ~~linked with a system for circulating the heat exchanging liquid, wherein said system comprising comprises a~~ means (30) for adjusting the temperature (t<sub>2</sub>) and the circulation flow rate of the liquid (31) in relation to the temperature (t<sub>1</sub>) of the roll (2).

7. (Currently Amended) ~~A-detection~~ The device for detecting the flatness of a band product according to claim 5, ~~characterised in that~~ wherein the forced cooling means comprises at least one spray ramp (35) parallel to the external face (13) of the roll, ~~linked with a system (36) for supplying a heat exchanging fluid and fitted with a plurality of spray nozzles (37) whereas~~ wherein each fluid jet from one spray nozzle covers a cooling angular sector (B), ~~whereas~~ wherein the system includes (36) ~~is associated with~~ means (36') for adjusting the flow rate sprayed in relation to the temperature of the band (2).

(B)  
(Cont'd)

8. (Currently Amended) ~~A detection~~ The device for detecting the flatness of a band product according to claim 7, ~~characterised in that it~~ wherein the device further comprises a cooling caisson (30) extending along the free sector of the roll and inside which is placed at least one fluid spray ramp (35), ~~whereas the~~ wherein said caisson (30) exhibits two longitudinal walls (33, 34) parallel to the axis of the roll (1) and is retracted at an angle to delineate a roll cooling sector, wherein (B), ~~whereby~~ each longitudinal wall (33, 34) has an edge (33', 34') parallel to the external face (13) of the roll and retracted from the said face by a small distance.

9. (Currently Amended) ~~A detection~~ The device for detecting the flatness of a band product according to one of the claims 5 to 8, ~~characterised in that it~~ wherein the device further comprises a means (5) for fast retraction of the band (2) with respect to the roll (1).

10. (Currently Amended) ~~A detection~~ The device for detecting the flatness of a band product according to claim 9, ~~characterised in that~~ wherein the measuring roll (1) is mounted to rotate round its axis (10) on a supporting cradle (7, 16) moving along a direction transversal to the a running plane of the band (2) between a an application position for applying the roll (1) on the said band and a retracted position, ~~whereas the~~ wherein said cradle (7, 16) is associated with two deflectors (25, 25') (82, 82') placed respectively upstream and downstream from the measuring roll (1) in the running direction of the band (2) and on the side opposite to the cradle with respect to the said

band, so that the band (2) is applied on a set angular sector (A) of the roll (1), in the application position of the said roll.

11. (Currently Amended) ~~A-detection~~ The device for detecting the flatness of a band product according to claim 10, ~~characterised in that~~ wherein the supporting cradle (7) of the roll is mounted to pivot round an axis (70) parallel to the axis of the roll (1) and is associated with at least one jack (74) for controlling the pivoting of the cradle (7) between an the application position of the roll (1) on the band (2) and a the retracted position.

12. (Currently Amended) ~~A-detection~~ The device for detecting the flatness of a band product according to claim 10, ~~characterised in that~~ wherein the supporting cradle (16) of the roll is mounted to slide perpendicular to the running plane of the band (2), between an the application position and a the retracted position.

13. (Currently Amended) ~~A-detection~~ The device for detecting the flatness of a band product according to claim 10, ~~characterised in that~~ wherein the measuring roll (1) is placed between two pairs of pinch rolls, respectively upstream (8) and downstream (8'), each pair of pinch rolls comprising a fixed roll (81) and a movable roll (82) mobile vertically for clamping the band 2 and ~~in that~~ wherein both pairs of pinch rolls (8, 8') are associated respectively with individual rotational driving means that determine angular speed of the downstream rolls (8'), a speed which is slightly greater than the angular

speed of the upstream rolls (8'), in order to subject the band (2) to a set application tension on the measuring roll (4).

14. (Currently Amended) ~~A-detection~~ The device for detecting the flatness of a band product according to claim 13, ~~characterised in that~~ wherein the rotational speeds and the torques applied on both pairs of pinch rolls, respectively upstream (8) and downstream (8'), are adjusted in relation to the rolling speed in order to determine separately the tension levels of the band (2), respectively, at the outlet of ~~the~~ a roll mill (6'), on the measuring roll (4) and on ~~the~~ a coiler (24).

15. (Currently Amended) ~~A-detection~~ The device for detecting the flatness of a band product according to one of the claims 5 to 8, ~~characterised in that~~ wherein the measuring roll includes ~~is of the type comprising~~ a plurality of the detection zones retracted in the direction transversal to the band and distributed over the whole length of the roll, ~~whereas~~ wherein the means for measuring the load in each detection zone comprises a sensor transmitting a signal depending on the application pressure of the corresponding zone of the band as the band passes through the angular contact sector, and ~~in that~~ wherein the said detection zones are brought back to the same equilibrium temperature, at each passage through the free sector of the roll.

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